

The Global Monitoring Plan on Persistent Organic Pollutants, a tool to evaluate the effectiveness of measures undertaken under the UNEP Stockholm Convention on POPs.

Ramon Guardans,
Ministry of the Environment Madrid,
SC Center for Clean Production CPRAC
Co Chair of the GMP on POPs

JPL , Pasadena 3 February 2012

Brief introduction to POPs

Scientific questions relevant to policy

The UNEP Stockholm Convention on POPs

The Global Monitoring Plan on POPs and the Effectiveness
Evaluation of the SC

Closing remarks

Brief introduction to POPs

POPs are artificial chemicals (with very minor exceptions) that are

Persistent

Resist degradation and can be in the atmosphere from days to years and in other media for decades

Volatile

By their physical properties can be in the gas phase on aerosol and travel long distances, be deposited and volatilized

Bioaccumulative and bioamplified

Accumulate in bodies over time and concentrate along food chains

Toxic

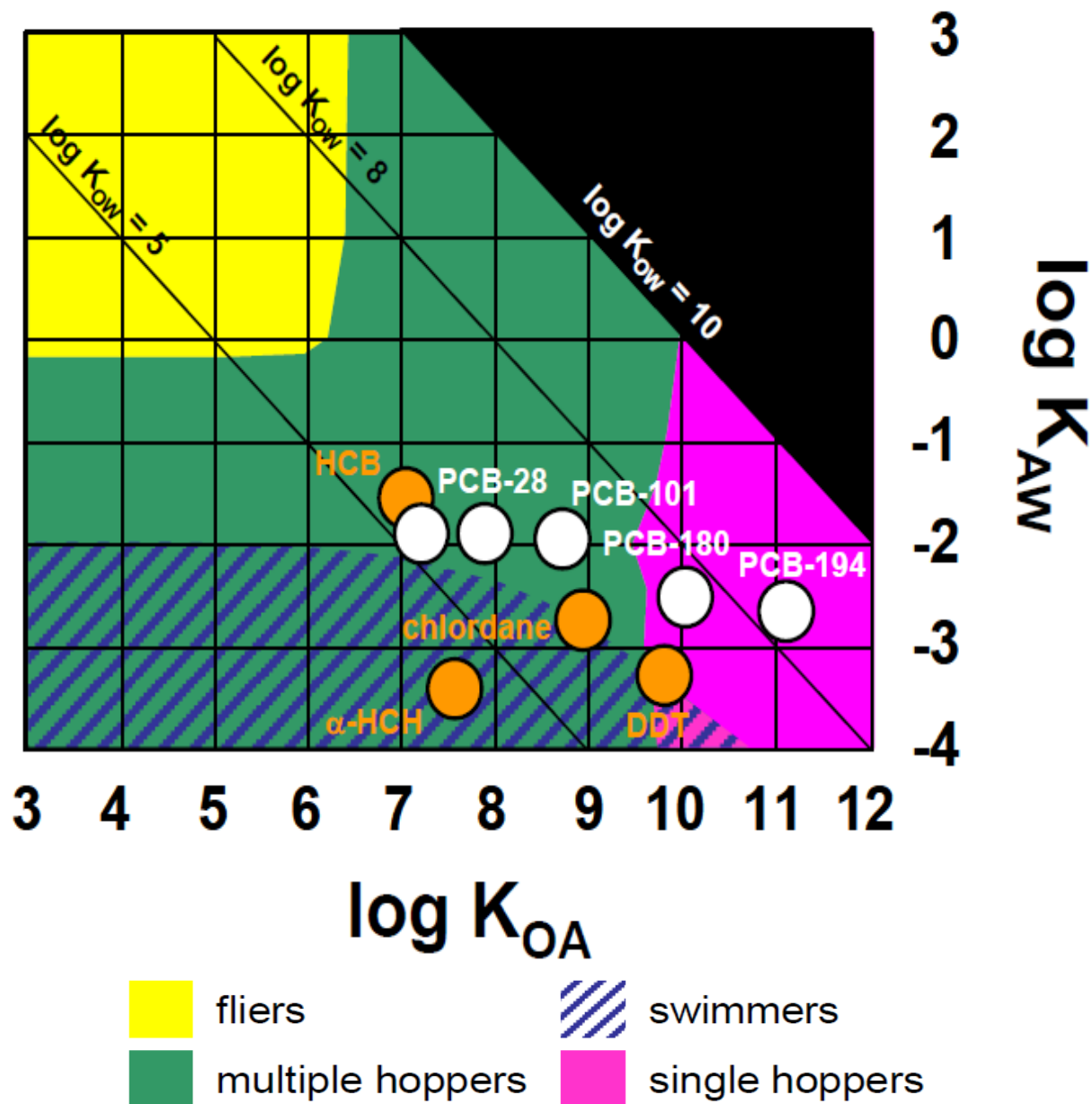
Cause adverse effects to humans and the environment (endocrine disruption, cancer, others)

Currently listed POPs

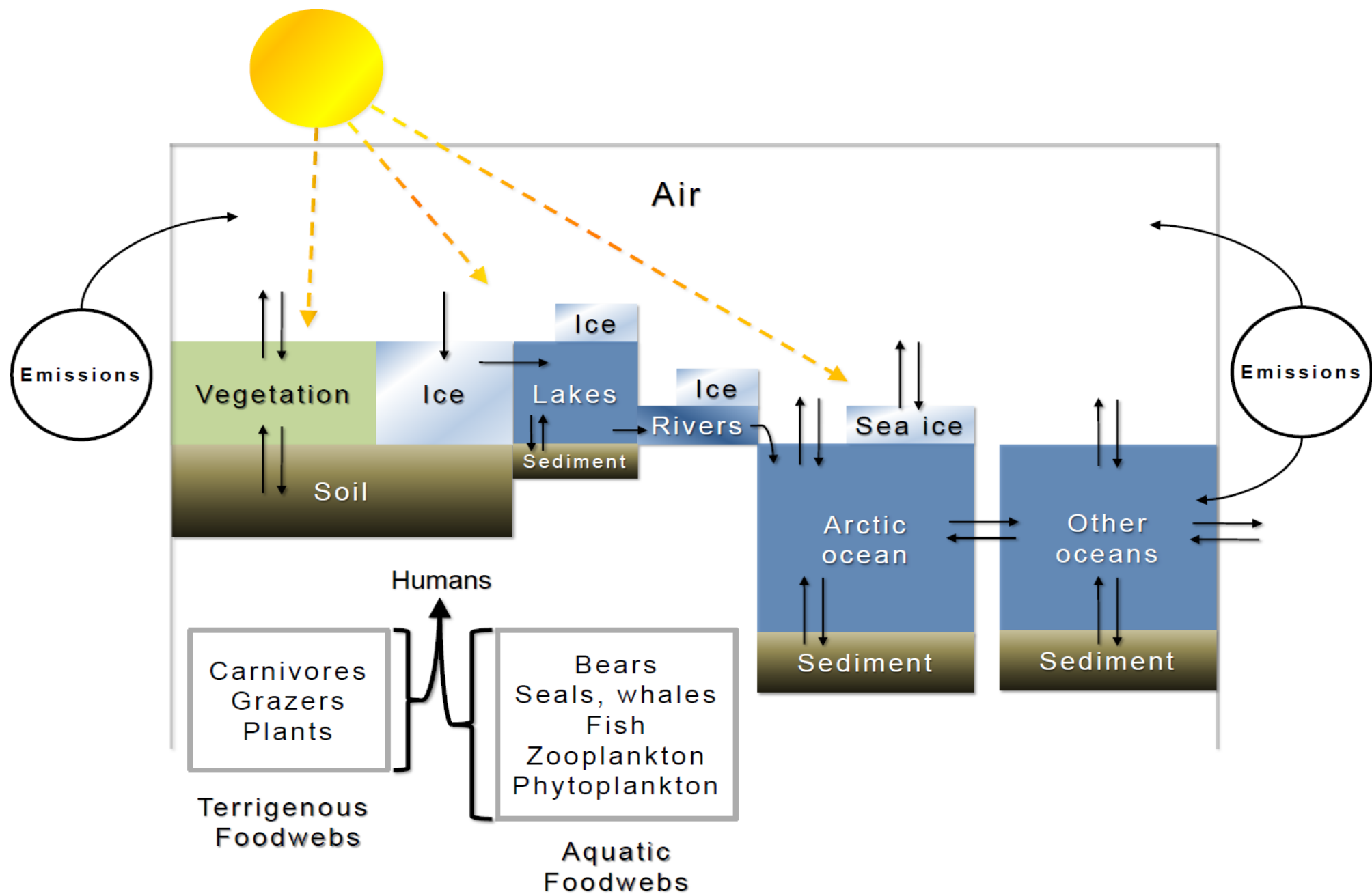
Pesticides: aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene (HCB), mirex, toxaphene; chlordecone, alpha hexachlorocyclohexane, beta hexachlorocyclohexane, lindane, (HCH) pentachlorobenzene;

Industrial chemicals: hexachlorobenzene, polychlorinated biphenyls (PCBs); hexabromobiphenyl, hexabromodiphenyl ether and heptabromodiphenyl ether, pentachlorobenzene, perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride (PFOS), tetrabromodiphenyl ether and pentabromodiphenyl ether; (PBDE)

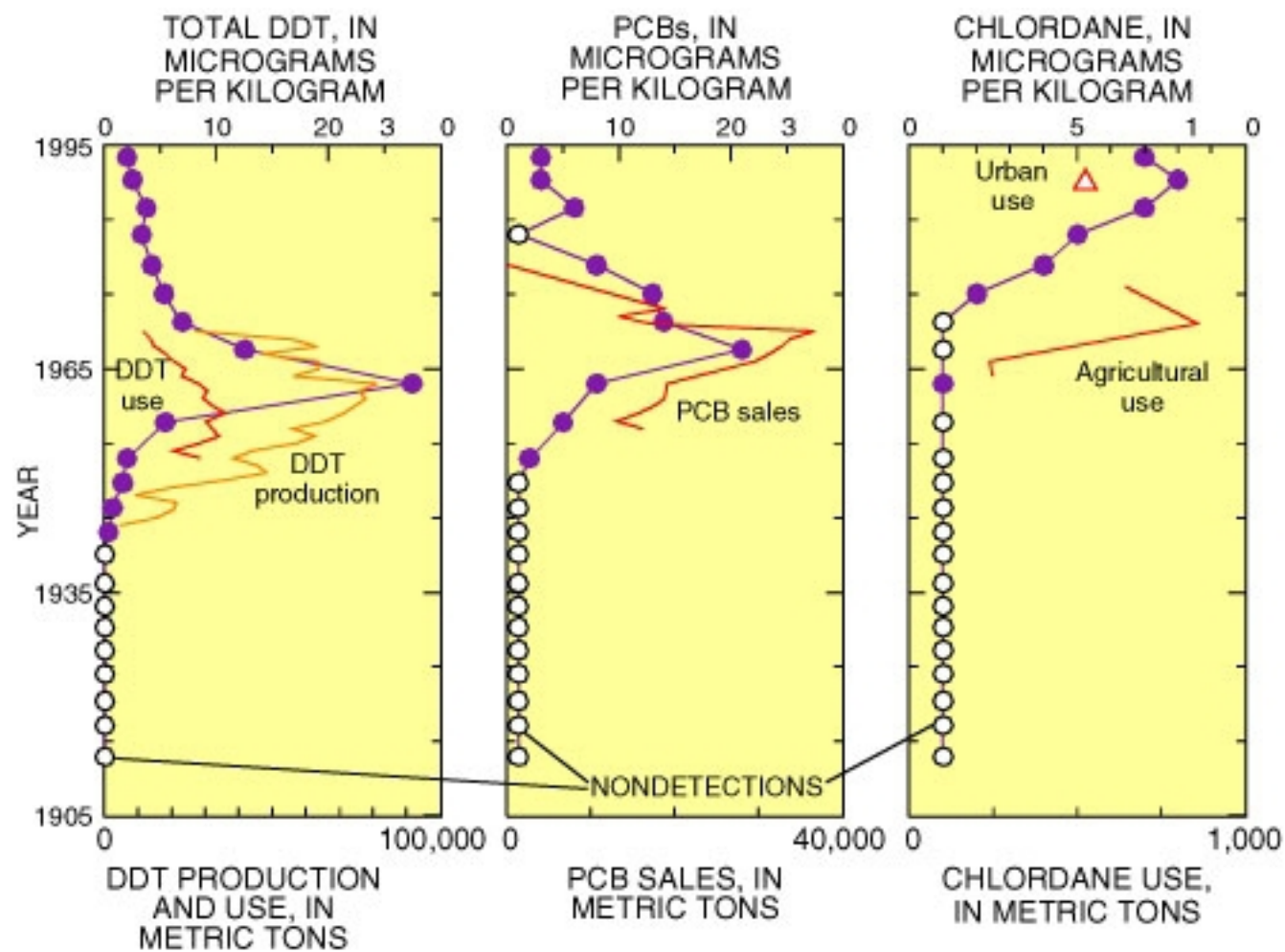
By-products: hexachlorobenzene; polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDF), and PCBs. alpha hexachlorocyclohexane, beta hexachlorocyclohexane and pentachlorobenzene.



Major modes of transport of perfectly persistent, hypothetical chemicals defined by their partitioning properties $\log K_{AW}$ and $\log K_{OA}$, calculated with the Globo-POP model assuming 10 years of steady emissions into air. [Wania *et al.*, 2006]

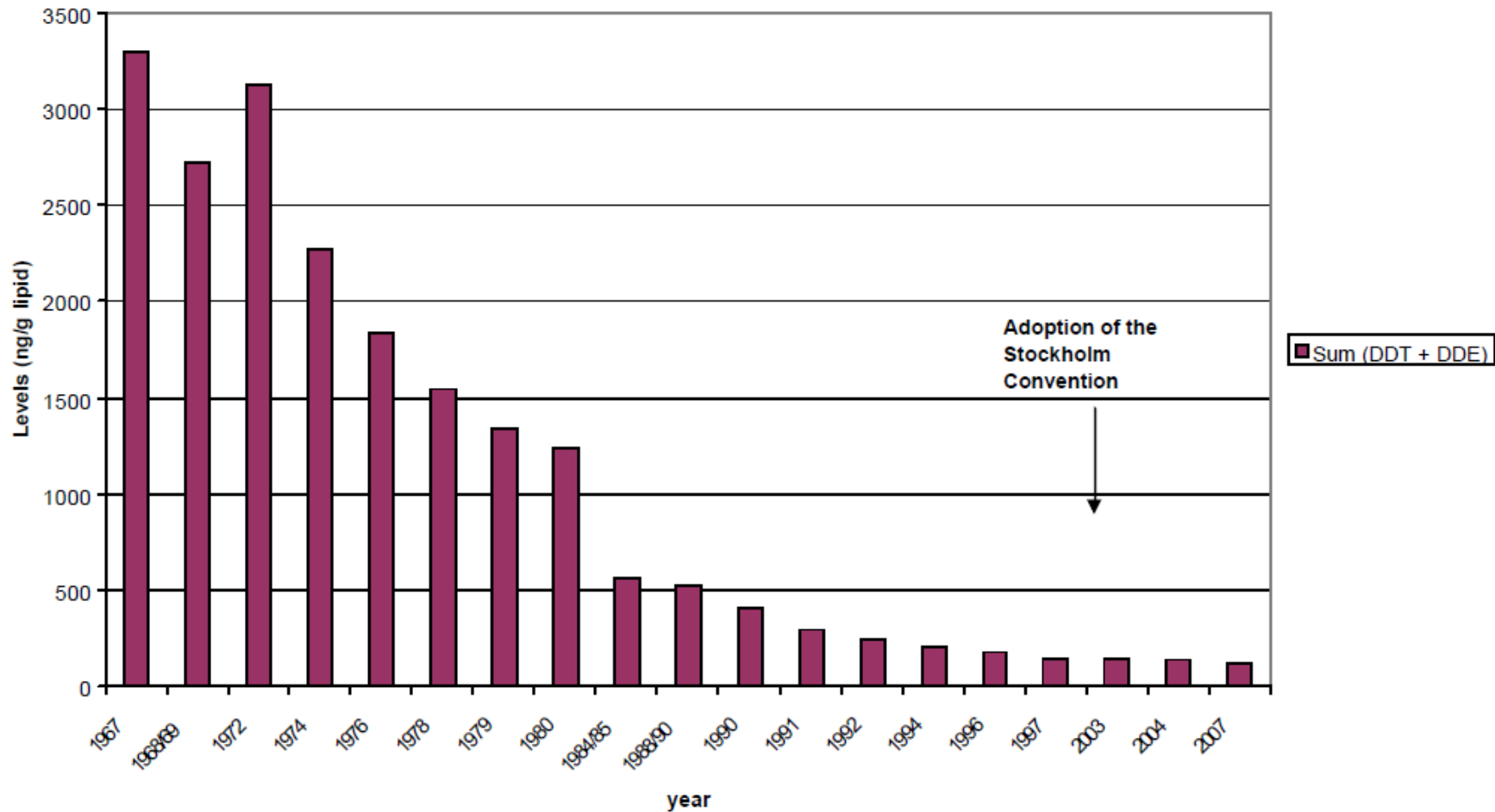


Draft conceptual figure showing pathways for POPs transport



Sediment cores USGS White Rock Lake, Dallas

Sum of p,p'-DDT and p,p'-DDE in mothers milk from Stockholm, Sweden

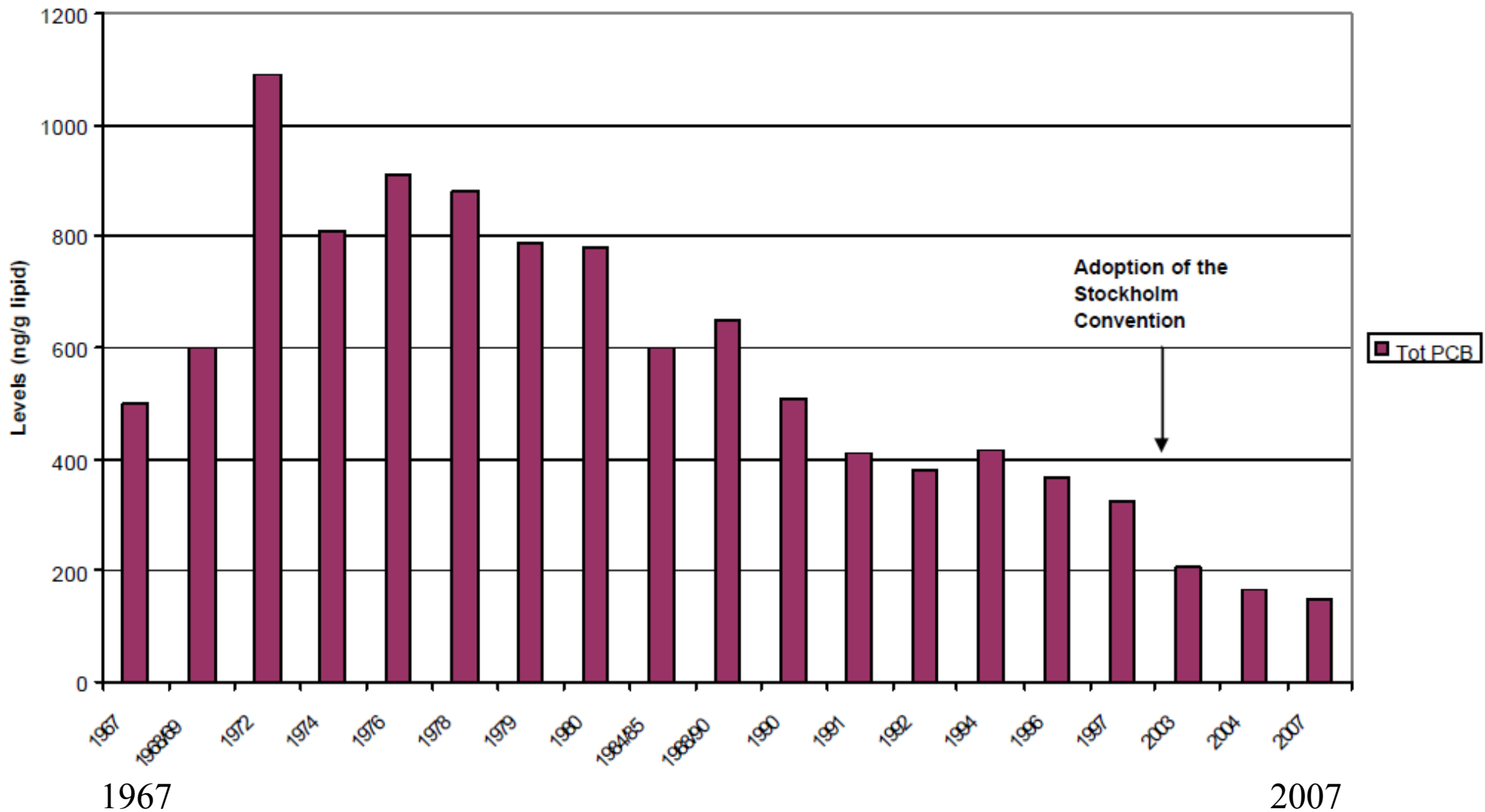


1967

2007

Levels of sum DDT (sum of p,p'-DDE and p,p'-DDT) in mothers milk from Stockholm, Sweden (source: GMP Global Monitoring Report 2009)

Total PCB in mothers milk from Stockholm, Sweden



Levels of sum PCB (6 congeners) in mothers milk from Stockholm, Sweden
Source GMP Global Monitoring Report 2009

Approximate Time lags

substance to market 2-5 years

substance to problem 5-10 y

market to problem 10-20 y

problem to regulation 20-30 y

regulation to effect 5-10 y

exposure to effect 10-20 y

Scientific questions relevant to policy

Observational evidence

Measurements in Air,:

Active samplers. Accurate, and measure gas and particle phase,
Costly, high maintenance and intermittent (can miss episodes)

Passive samplers : semi quantitative, continuous, low cost
Do not measure particle phase

Atmospheric transport modelling: What fraction of the observed concentrations are from local or remote origins, what is the impact of LRT on local concentrations

Multimedia modelling. POPs models must not only simulate the behaviour of pollutants in the atmosphere, but they must also simulate the exchange between the atmosphere and other environmental media (such as water, soil, snow, ice, and vegetation) and the transport and transformations that occur in those other media.

Impact of Climate Change on POPs pathways

Impacts on Health and Ecosystems.

Stochastic effects, (no lower threshold)

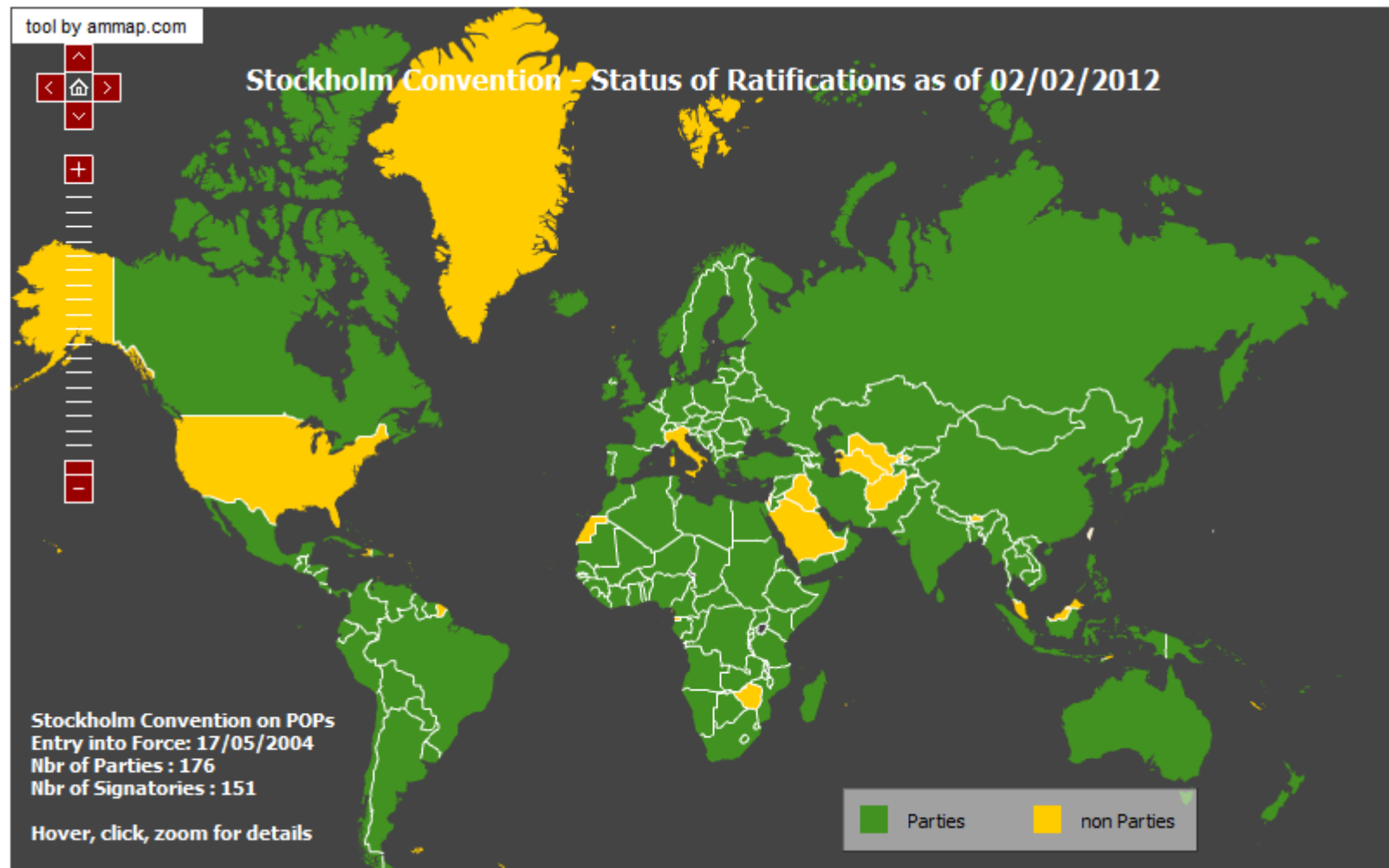
Timelags (exposure -effect),

Dose response are for single pollutants and one end-point, exposure to mixtures and multiple endpoints are difficult to deal with

The UNEP Stockholm Convention on POPs

Signed in 2001 , entered in to force in 2004., 178 parties in 2012

Article 1:Objective:: **“the objective of this Convention is to protect human health and the environment from persistent organic pollutants.”**



The UNEP Stockholm Convention on POPs

The convention has a procedure to identify and list POPs
When a POP is listed it is included in the following Annexes

Annex A, elimination of intentional use
Annex B control of unintentional releases
Annex C exemptions

The Convention has an innovative approach in Article 16 on Effectiveness Evaluation

Three components are the base for EE

Reports submitted by Parties on actions undertaken

Information compiled by the secretariat on activities under the SC

The Global Monitoring Plan

The Global Monitoring Plan on POPs under Article 16 of the SC

The GMP was established in 2001 and decided to focus on two Core Media

Air and Human tissue (breast milk and blood)

Human tissues

UNEP Chemicals in cooperation with the WHO has organized a number of campaigns to obtain breast milk samples on a global basis.

Some countries (eg Sweden, Germany) , have established long term stable monitoring of POPs in breast milk

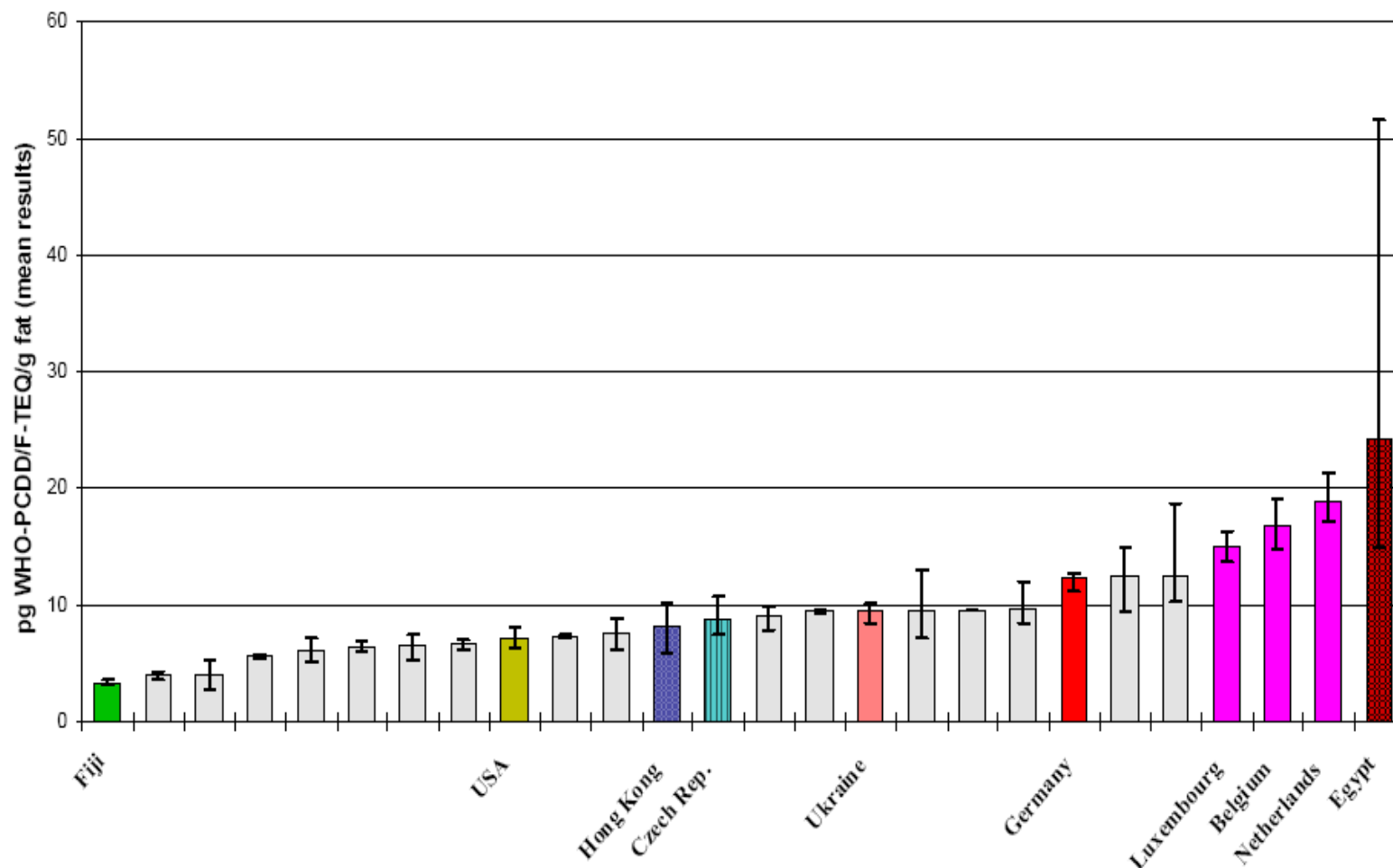
Air

A number of stable long term measuring networks exist

Passive sampling networks have been established under the GMP

The Global Monitoring Plan on POPs under Article 16 of the SC

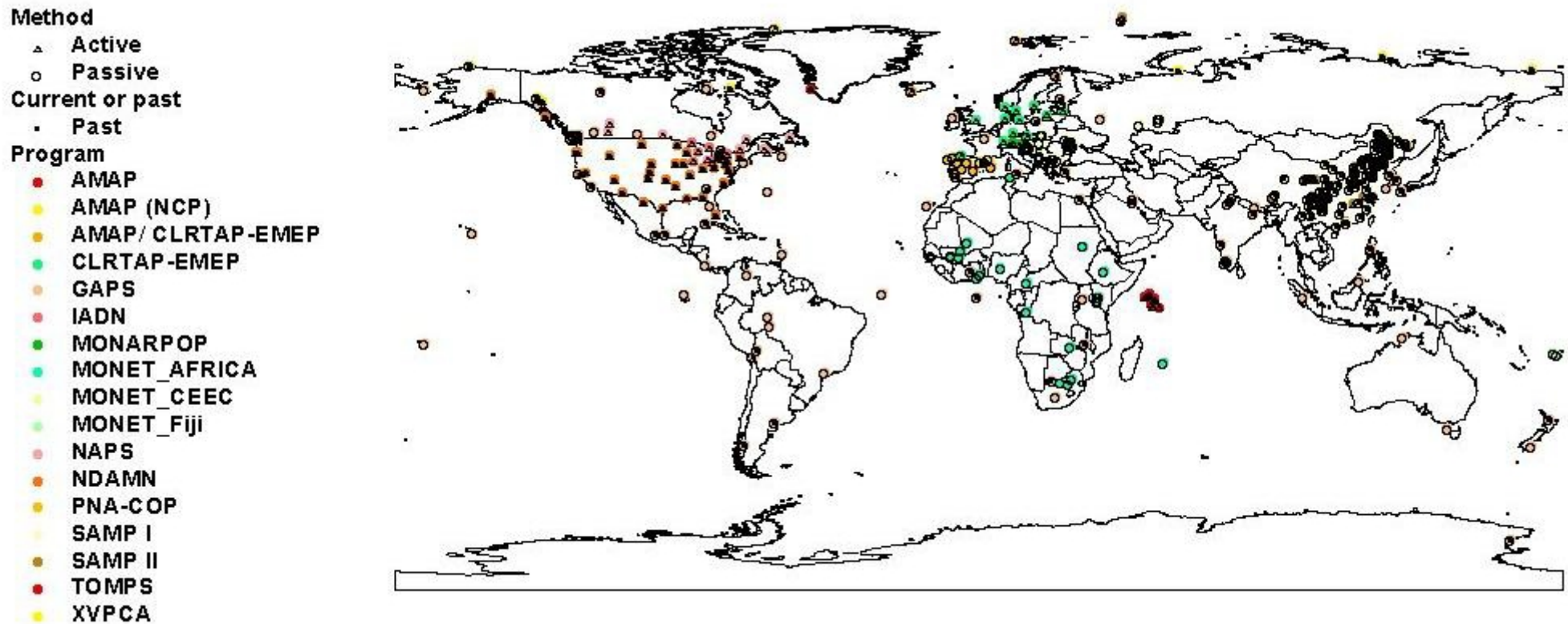
3rd rd round (2000-2003) – PCDD/PCDF



Marlisch et al., Dioxin2010, San Antonio, TX

The Global Monitoring Plan on POPs under Article 16 of the SC

Existing monitoring networks of POPs in AIR



Source: HTAP 2010 report section C chapter 2

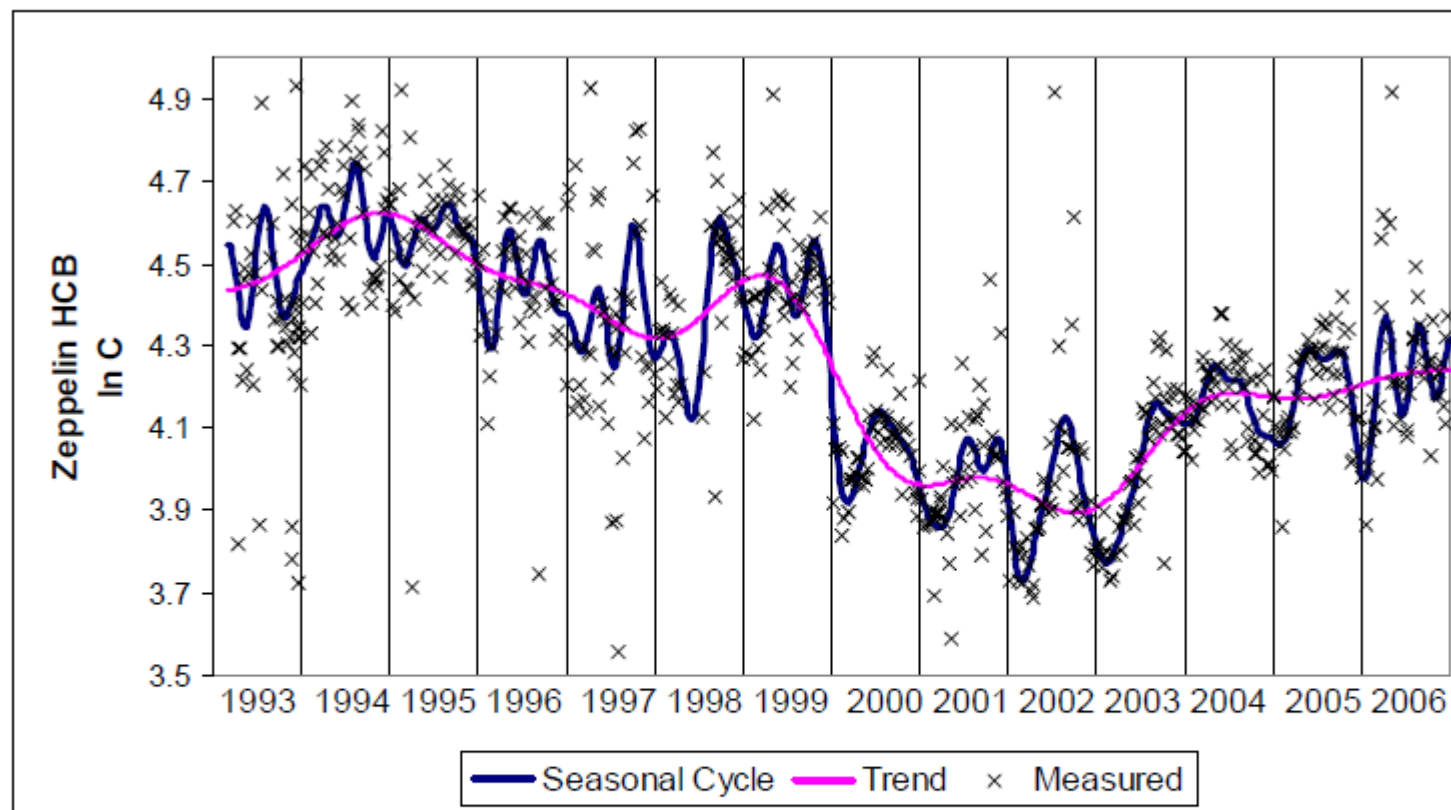


Figure 3: DF analysis of HCB levels in Zeppelin air [pg/m^3] from 1993 – 2006. Measured data, seasonal cycles and trend line is presented.

Please note: The concentration axis is given in logarithmic scale (ln).

Source: H. Hung et al Arctic Monitoring and Assessment Program (AMAP) 2009

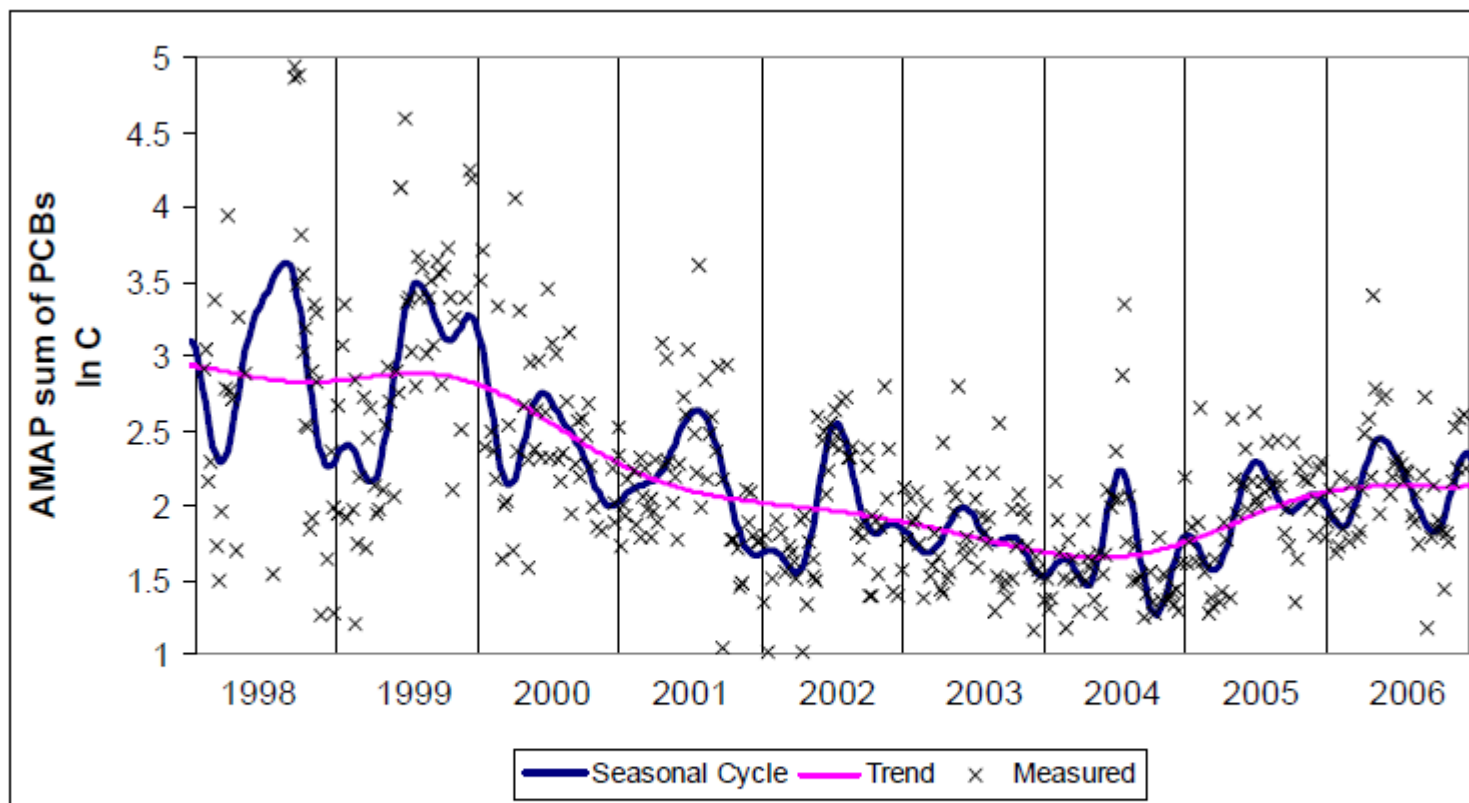


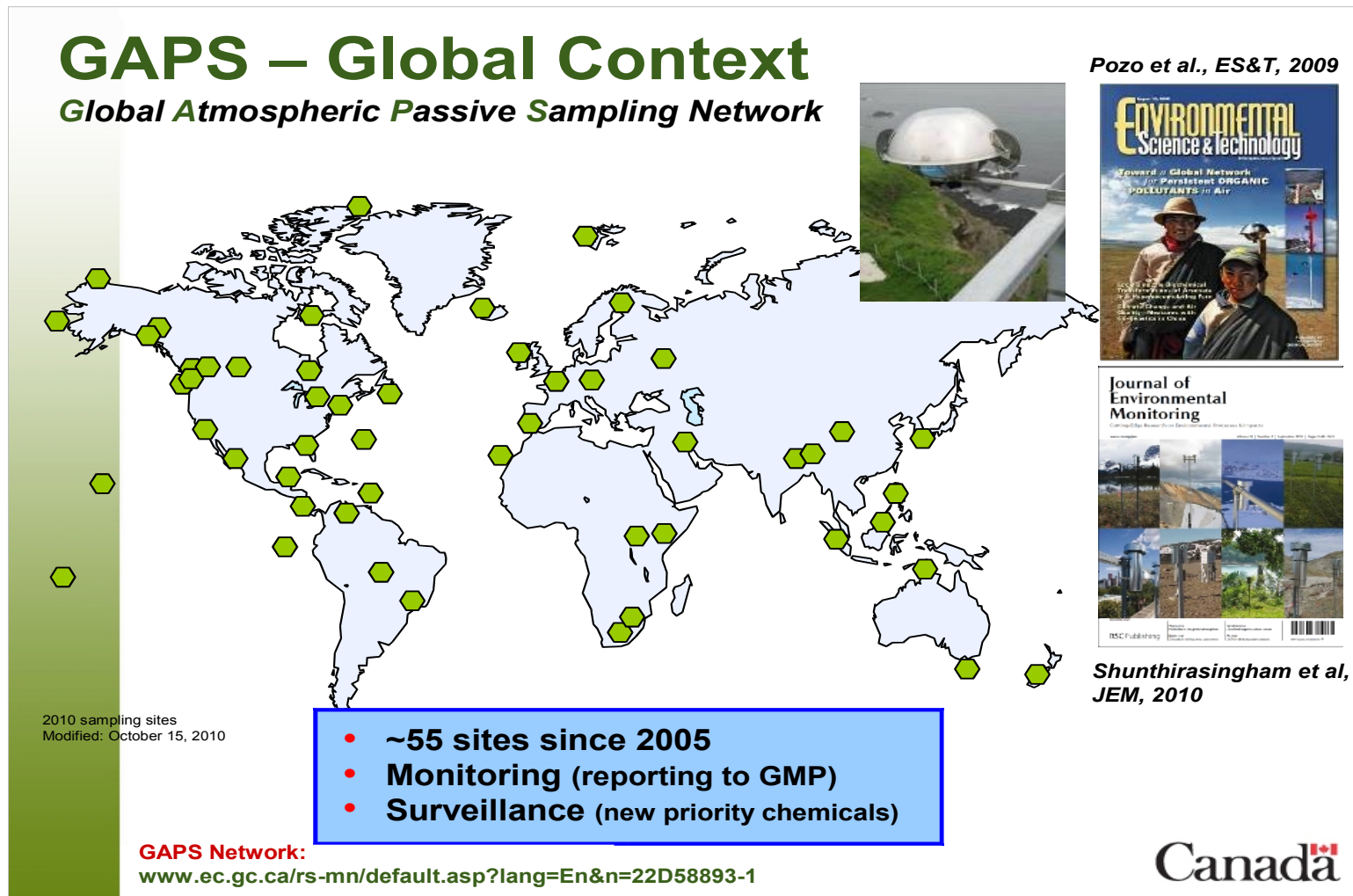
Figure 4: DF analysis of PCB levels in Zeppelin air [pg/m^3] from 1993 – 2006. Measured data, seasonal cycles and trend line is presented.

Please note: The concentration axis is given in logarithmic scale (ln).

Source: H. Hung et al Arctic Monitoring and Assessment Program (AMAP) 2009

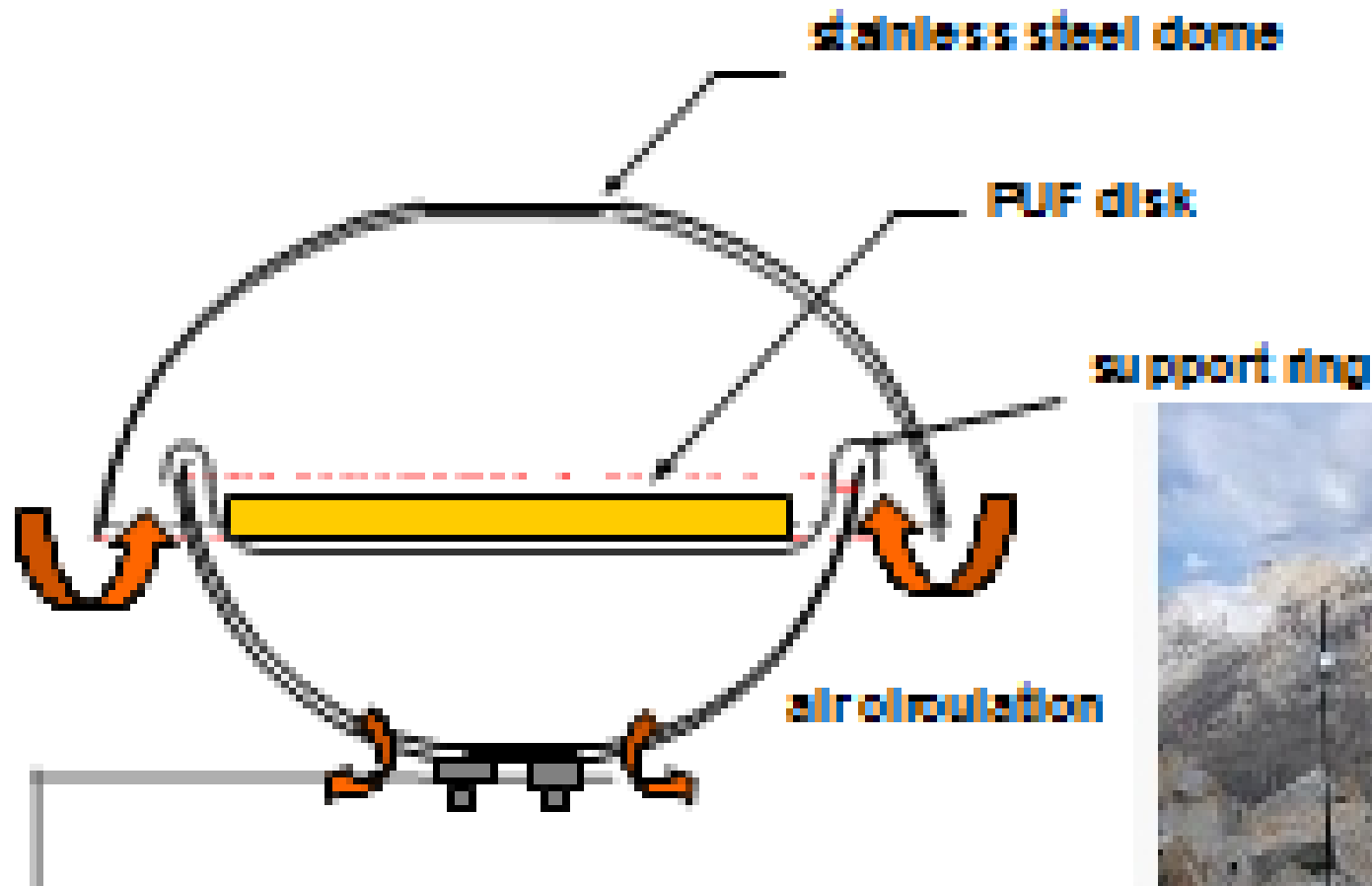
The Global Monitoring Plan on POPs under Article 16 of the SC

The Global Atmospheric Passive Sampling Network



Source: Environment Canada 2012

The Global Monitoring Plan on POPs under Article 16 of the SC



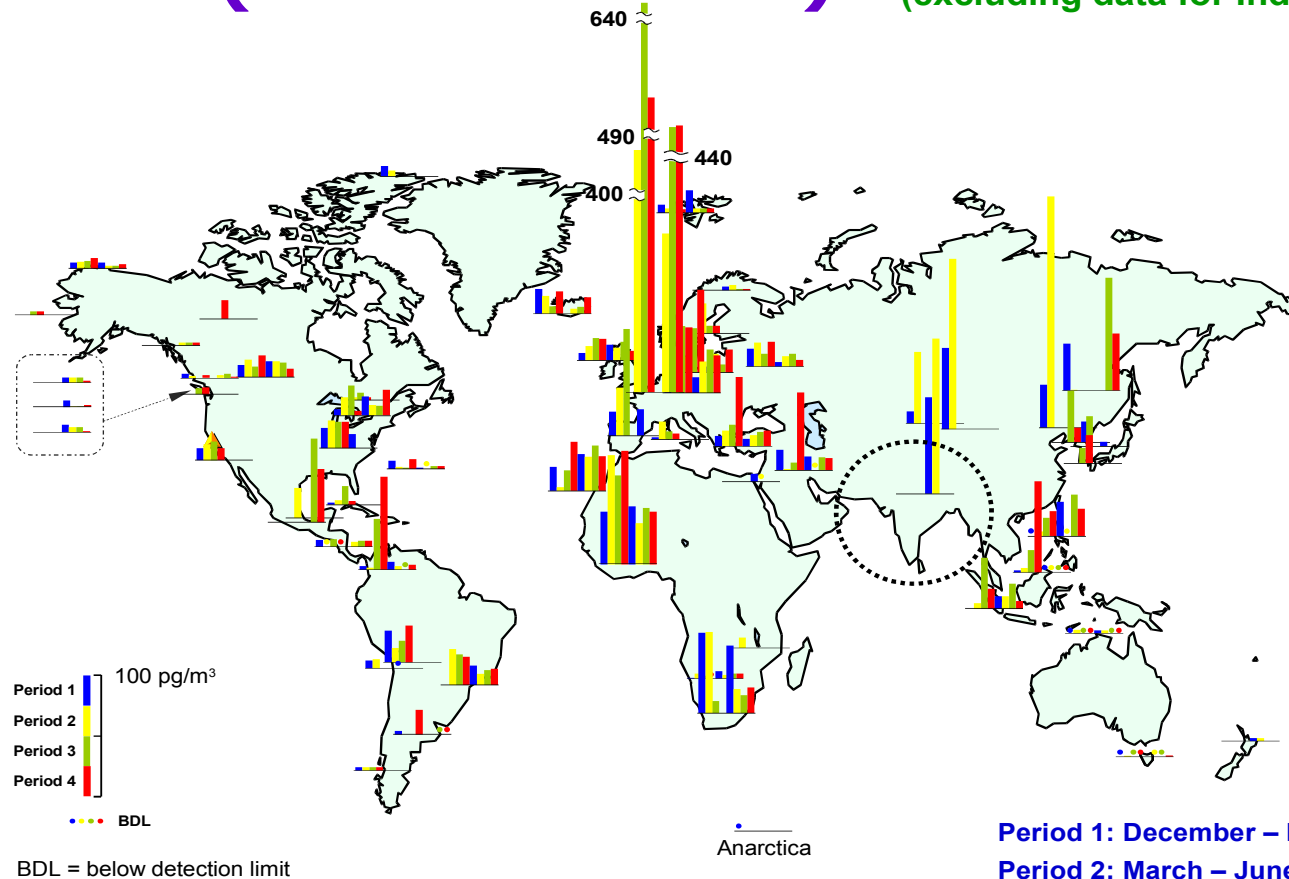
Outline of one of the types of Passive sample



Bolivian Andes at 5200 m a.s.l.

γ-HCH (2005 and 2006)

Range: BDL to 650 pg/m³
(excluding data for India sites)



Environment
Canada

Environnement
Canada

Canada

Example of data on γ-HCH from GAPS in 2005 and 2006,
Source T.Harner Environment Canada

The Global Monitoring Plan on POPs under Article 16 of the SC

Monitoring Network established in Spain under the GMP



Closing remarks

Scientific questions relevant to policy

Observational evidence

PAS do provide interesting and useful information but are difficult to calibrate (effects of temperature and wind) thus “internal” seasonal and congener fractions are more robust than absolute values comparisons

Could anyone come up with a passive sampler that is able to deal with aerosols, particles? Able to measure airflow?

It would be interesting to develop “Observation simulators” that reproduce the behaviour of different samplers (located on a concentration field generated by a model) and could be used to compare models with measurements

Closing remarks

Scientific questions relevant to policy

Long Range Transport modelling

Simulation of congener mixtures

Local/regional/global

Effects of CC on LRT and of POPs on CC impacts

Multimedia modelling (atmosphere/ocean/land/ice/biota)

Relation with observations, potential of Machine Learning and KDD

Impact modelling

Metabolic timelags

Mixtures

Multiple endpoints

Closing remarks

POPs are a relevant Public health and Environmental issue and provide also a particularly stimulating theoretical environment in the sense that they require an integration of scientific disciplines, temporal and spatial scales in a coherent frame.

The control of releases requires a coordinated approach integrating multiple social and industrial sectors.

Their capacity to move in air and water imposes a geographical integration, where national borders are quite irrelevant,

And in that sense they present a suggestive blueprint of a global cooperative strategy to deal with the future.

More information at:

The UNEP Stockholm Convention on POPs

www.pops.int

Arctic Monitoring and Assessment Programme AMAP

www.amap.no

Background Air Monitoring of Persistent Organic Pollutants in East Asian Countries

Co-operative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe EMEP

www.emep.int

Global Atmospheric Passive Sampling Survey GAPS

Integrated Atmospheric Deposition Network IADN

World Health Organization human milk survey WHO

www.who.int

Task Force on Hemispheric Transport of Air Pollution

www.htap.org

Thank you for your attention

On a friday afternoon!